

[illegible]

1            Scope:

This procedure establishes the requirements for the electrical continuity and hypot testing of all RHIC dipole and quadrupole bus subassemblies before installation in a magnet yoke.

2            Applicable Documents:

The following documents of the issue in effect on the issue date of this procedure form a part of this procedure to the extent specified herein:

RHIC-MAG-Q-1000 - Magnet Division Procedure for Control of Measurement  
Test Equipment

RHIC-MAG-Q-1004 - Discrepancy Reporting Procedure

RHIC-MAG-R-7242 - RHIC Dipole Hypot Testing

RHIC-MAG-R-7243 - RHIC Dipole Low Precision Resistance Insulation  
Test

\*                      Dipole Bus Assembly Drawing

\*                      Quadrupole Bus Assembly Drawing

\*See applicable magnet parts list for specific subassembly drawings.

3            Requirements:

3.1          Safety Precautions:

3.1.1        The technicians shall be qualified by their cognizant technical supervisor in the operation of the required test equipment and these electrical testing procedures. They shall be familiar with the latest revision of the applicable documents referenced in section 2. In addition, some of these tests require the technician to have special training. A list of qualified personnel shall be maintained with the RHIC ES & H Coordinator and the RHIC Training Coordinator.

3.1.2        Some of these electrical test procedures have specific safety requirements. The technicians performing these specific tests shall rigorously follow all the safety requirements listed as well as those prescribed by the BNL ES & H Standard.

- 3.1.3 This testing poses a Class "C" electrocution hazard. At least two properly trained technicians must be present to perform this testing. When testing, a trained technician shall be stationed at any point where the item under test is accessible to unauthorized people, and barriers shall be set up. Signs shall be posted reading "DANGER HIGH VOLTAGE" and warning lights shall be turned on.
- 3.2 Test Equipment as required are listed in RHIC-MAG-R-7242 and R-7243.
- 3.3 Safety Precautions:
  - 3.3.1 Two technicians are required for hypot testing.
  - 3.3.2 No other personnel are allowed in the test area when conducting hypot testing.
  - 3.3.3 Assure the presence of a good ground lead connection to an earth ground before initiation of test.
- 3.4 Procedure - Perform the following electrical tests and record results on traveler.
  - 3.4.1 Dipole Bus Subassembly.
    - 3.4.1.1 Continuity tests of all trim or voltage tap leads. Follow RHIC-MAG-R-7243.
    - 3.4.1.2 Hypot tests. Follow RHIC-MAG-R-7242, 7243. Leakage current for all tests shall not exceed 50 $\mu$ A.
      - 3.4.1.2.1 Dipole bus to dipole bus at 5 kV.
      - 3.4.1.2.2 Both dipole bus conductors to all trim/voltage tap lead bundles (Ground) at 5 kV.
      - 3.4.1.2.3 Each bundle of trim/voltage tap leads to all other bundles of trim/voltage tap leads at 5 kV.
      - 3.4.1.2.4 Each trim or voltage tap level lead to every other lead in the same bundle at 5 kV.
  - 3.4.2 Quadrupole Bus Subassembly.
    - 3.4.2.1 Continuity tests of all trim/voltage tap/power leads. Follow RHIC-MAG-R-7243.
    - 3.4.2.2 Hypot tests. Follow RHIC-MAG-R-7242, 7243. Leakage current for all tests shall not exceed 50 $\mu$ A.

- 3.4.2.2.1 Quad bus to quad bus at 5 kV.
- 3.4.2.2.2 Both quad bus conductors to all trim/voltage tap/power lead bundles at 5 kV.
- 3.4.2.2.3 Each bundle of trim/voltage tap/power leads to all other bundles of wires leads at 5 kV.
- 3.4.2.2.4 Each trim/voltage tap/power lead to every other lead in the same bundle at 5 kV.

4 Quality Assurance Provisions:

- 4.1 The quality assurance provisions of this procedure requires that the technician shall be responsible for performing all inspections and tests in compliance with the procedural instructions contained herein and the recording of test results on the data sheet(s) and/or on the production traveler.
- 4.2 The technician is responsible for verifying that the test and measurement equipment used in this procedure has been calibrated and that the calibration sticker (date) has not expired as per RHIC-MAG-Q-1000.
- 4.3 The technician is responsible for notifying the technical supervisor and/or the cognizant engineer of any discrepancies occurring during the performance of this procedure. All discrepancies shall be identified and reported as per RHIC-MAG-Q-1004.

5 Preparation for Delivery:

N/A

APPENDIX A

DATA SHEET 1

RHIC Electrical Testing of Dipole Bus Assembly

A. Continuity Tests

Follow RHIC-MAG-R-7243

Record RHIC-MAG-R-7243 Rev. No. \_\_\_\_\_

1. All voltage tap leads. (6) violet cable \_\_\_\_\_

B. Hypot Tests

Follow RHIC-MAG-R-7242, 7243.

Record: RHIC-MAG-R-7242 Rev. No. \_\_\_\_\_

1. Upper dipole bus to lower dipole bus at 5 kV.

Ohmmeter \_\_\_\_\_  $\Omega$  ( $>20\text{M}\Omega$ )

Hypot Leakage Current at 5 kV \_\_\_\_\_  $\mu\text{A}$  ( $<50\mu\text{A}$ )

2. Both dipole bus conductors to the voltage tap cable (VIO) at 5 kV. (Temporarily connect together all trim lead wires; for the data below assume one voltage tap lead bundle.)

Ohmmeter \_\_\_\_\_  $\Omega$  ( $>20\text{M}\Omega$ )

Hypot Leakage Current at 5 kV \_\_\_\_\_  $\mu\text{A}$  ( $<50\mu\text{A}$ )

3. Each voltage tap lead to every other lead in the same bundle at 5kV. (Temporarily connect together all wires in the bundle but the one wire being tested. For the data below it is assumed that one bundle of six wires exists.)

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Voltage Tap Cable (Vio) <u>Lead Wire #</u>	Continuity Test <u>Ohmmeter (<math>\Omega</math>)</u>	Hypot Leakage Current <u>at 5 kV (<math>\mu</math>A)</u>
1 - BRN	_____	_____
2 - RED	_____	_____
3 - ORN	_____	_____
4 - YEL	_____	_____
5 - GRN	_____	_____
6 - BLU	_____	_____

Comments: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Above work done by: \_\_\_\_\_

\_\_\_\_\_  
Name & Life No., Date

APPENDIX B

DATA SHEET 2

RHIC Electrical Testing of Quadrupole Bus Subassembly

A. Continuity Tests

Follow RHIC-MAG-R-7243

Record RHIC-MAG-R-7243 Rev. No. \_\_\_\_\_.

1. All s/c trim leads (6) in yellow cable \_\_\_\_\_  
All voltage tap leads (6) in white cable \_\_\_\_\_  
CQS Only: All wires (4) in sextupole power/voltage tap  
orange cable \_\_\_\_\_

B. Hypot Tests

Follow RHIC-MAG-R-7242, 7243.

Record: RHIC-MAG-R-7242 Rev. No. \_\_\_\_\_.

RHIC-MAG-R-7243 Rev. No. \_\_\_\_\_.

1. Quad bus to quad bus at 5 kV.  
Ohmmeter \_\_\_\_\_  $\Omega$  ( $>20M\Omega$ )  
Hypot Leakage Current at 5 kV \_\_\_\_\_  $\mu A$  ( $<50\mu A$ )

2. Both quad bus conductors to all trim/voltage tap lead bundles at 5 kV. (Temporarily connect together all lead wires in each trim/voltage tap cable; for the data below assume three bundles.)

1. (YEL) Trim Cable                      Ohmmeter \_\_\_\_\_  $\Omega$  (> 20M $\Omega$ )  
  
Hypot Leakage Current at 5 kV \_\_\_\_\_  $\mu$ A (<50 $\mu$ A)
2. (WHT) Voltage Tap Cable                      Ohmmeter \_\_\_\_\_  $\Omega$  (>20M $\Omega$ )  
  
Hypot Leakage Current at 5 kV \_\_\_\_\_  $\mu$ A (<50 $\mu$ A)
3. (ORN) Sextupole Cable CQS Only                      Ohmmeter \_\_\_\_\_  $\Omega$  (>20M $\Omega$ )  
  
Hypot Leakage Current at 5 kV \_\_\_\_\_  $\mu$ A (<50 $\mu$ A)

3. Each bundle of trim/voltage tap leads to all other bundles at 5 kV. (For those bundles being tested, temporarily connect together all wires. For the data below, it is assumed that three bundles exist.)

1. Yellow to White & Orange                      Ohmmeter \_\_\_\_\_  $\Omega$  (>20M $\Omega$ )  
  
Hypot Leakage Current at 5 kV \_\_\_\_\_  $\mu$ A (<50 $\mu$ A)
2. White to Yellow & Orange                      Ohmmeter \_\_\_\_\_  $\Omega$  (>20M $\Omega$ )  
  
Hypot Leakage Current at 5 kV \_\_\_\_\_  $\mu$ A (<50 $\mu$ A)
3. Orange to White & Yellow CQS Only                      Ohmmeter \_\_\_\_\_  $\Omega$  (>20M $\Omega$ )  
  
Hypot Leakage Current at 5 kV \_\_\_\_\_  $\mu$ A (<50 $\mu$ A)



4. Each trim/voltage tap lead to every other lead in the same bundle at kV. (Temporarily connect together all wires in the bundle but the one wire being tested.)

4.1	S/C Trim Cable (Yel)		Hypot Leakage Current at 5 kV ( $\mu$ A)
	<u>Lead Wire #</u>	<u>Ohmmeter (<math>\Omega</math>)</u>	<u>at 5 kV (<math>\mu</math>A)</u>
	1 - BRN	_____	_____
	2 - RED	_____	_____
	3 - ORN	_____	_____
	4 - YEL	_____	_____
	5 - GRN	_____	_____
	6 - BLU	_____	_____

4.2	Voltage Tap Cable (WHT)		Hypot Leakage Current at 5 kV ( $\mu$ A)
	<u>Lead Wire #</u>	<u>Ohmmeter (<math>\Omega</math>)</u>	<u>at 5 kV (<math>\mu</math>A)</u>
	1 - BRN	_____	_____
	2 - RED	_____	_____
	3 - ORN	_____	_____
	4 - YEL	_____	_____
	5 - GRN	_____	_____
	6 - BLU	_____	_____

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4.3 For CQS Only

Power/  
Sextupole  
Cable (ORN)

Lead Wire #

Ohmmeter ( $\Omega$ )

Hypot  
Leakage Current  
at 5 kV ( $\mu$ A)

1 - ORN

\_\_\_\_\_

\_\_\_\_\_

2 - GRY

\_\_\_\_\_

\_\_\_\_\_

3 - WHT

\_\_\_\_\_

\_\_\_\_\_

4 - BLK

\_\_\_\_\_

\_\_\_\_\_

Comments: \_\_\_\_\_

Above work done by: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
Name & Life No., Date

\_\_\_\_\_